● PRINTER RUSH ●

(PTO ASSISTANCE)

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[RUSH] **MESSAGE:** Page 20 of SPEC dated 04/25/00 line 24 is missing a US application serial no. Please provide.

Thank you,
MR

[XRUSH] **RESPONSE:** Correct-al.

Mark Brightwell 512-853-5800 **INITIALS:** PS

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the covariance matrix of the multichannel symbol sequence. In yet another embodiment, adaptive power and DOA estimation methods can be adapted to track the variations of these parameters. The DOA estimates, when used in conjunction with the timing offset, provides distance and direction information to locate the terminals, and thus may be used to facilitate handoff among different cells.

Thus the spatial processor 60 performs functions such as spatial signature estimation, constructing the uplink and downlink beamforming matrices or vectors for all terminals, and estimating signal parameters such as the uplink power and timing offset of the terminals.

FIG. 8 illustrates an examplary embodiment of the modulator 50 in accordance with the present invention. The modulator 50 includes a plurality of spreaders 150 based on the number of terminals which are capable of communicating with the base unit. In the embodiment shown in Figure 8, signals 80 intended for the terminals, e.g., $s_1(k)$ to $s_P(k)$ for terminal 1 to P, respectively, are first spread by spreaders 150,152 using PN code sequences 140,142 provided by a PN code generator 102. A set of downlink beamformers 144,146 are coupled to the spreaders to weight the resulting chip sequence 160,162 using downlink beamforming matrices (w_1' to w_P'). The final step of the SA-CDMA Modulator 50 is combining the beamformed sequences and generating multichannel downlink S-CDMA signals 168. This is accomplished in the present embodiment by digital combiners 158. There exist many alternatives to realized the aforementioned modulation functions including a one step method disclosed in copending patent application Serial No. 09/179,263 entitled "Method and Apparatus for Fast Modulation in Antenna Array CDMA Communications", which is hereby

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